

south as southeastern Honshu on the 10th. On the 11th and 12th the storm increased in energy as it proceeded northeastward, the wind rising to force 11 on the earlier date near 42° N., 155° E., and on the 12th near 48° N., 164° E. On the 13th and 14th the disturbance was central over the Bering Sea, but accompanying winds of fresh to whole gale force were experienced by a number of ships between 40° and 50° N., 160° E. and 160° W.

The third cyclone formed as a depression south of Japan about the 24th. Its center moved north along the Japanese east coast until the 27th, when it lay east of the Kuril Islands. Thence it proceeded into the Bering Sea. Gales of force 8-9 accompanied it during most of its passage of the usual ship-traveled zone during the 25th-26th. On the 27th, however, the Japanese S. S. *Hiye Maru* experienced gales of force 10 near 45° N., 155° E., with barometer depressed to 28.67 inches. On the early morning of the 28th, while the storm center was far to the northeastward, this ship experienced a west gale of force 11 near 42° N., 149° E.

On the 18th the British S. S. *Empress of Asia* encountered a gale of force 11, barometer 28.60, near 46° N., 159° E. It is evident that a deep cyclone was then in existence in this stormy northwestern sector of the ocean, but little is known of its history, except that on the 18th winds of force 10, in addition to the force 11 mentioned, occurred over a considerable region east of the Kuril Islands.

On the 11th, 12th, and 24th ships encountered fresh to strong gales off the Washington and Oregon coasts, and to seaward practically as far as 140° W. The highest wind velocity at the exposed land station, Tatoosh Island, was 56 miles from the southwest on the 24th. The 2d, 3d, and 20th were also stormy days locally between approximately 40° and 50° N., 130° and 145° W., with gales of force 10 occurring on the 2d and 20th.

Northeast of the Hawaiian Islands several depressions affected the weather situation. The first was of brief existence, but resulted in a gale of force 9 near 25° N., 154° W. The most important low was that which appeared central near 27°-28° N., 142°-143° W., on the 14th and 15th, thence moved slowly northwestward, diminishing in intensity until its disappearance on the 22d north of Midway Island. During the 14th and 15th—the only days on which gales were reported in connection with the disturbance—the field of high winds lay roughly between 25° and 35° N., 135° and 150° W. The maximum wind force was 10, near 26° N., 146° W., on the 14th.

On March 4 the British S. S. *Makura* reported an east gale of force 9 in 8° 35' N., 138° 08' W. Owing to the fact that the ship's corrected barometer fell to 29.66 on that date, there is room for a reasonable suspicion that a depression had formed in the vicinity.

Tehuantepecers.—Northerly occurred in the Gulf of Tehuantepec as follows: Of force 7 on the 2d; of force 8 on the 14th.

Fog.—The distribution of fog differed considerably in March from that of the preceding February, there being a much less occurrence along the American coast, except in the Tropics, and much more trans-Pacific fog. For the coast, it was reported on 2 days north of the 30th parallel; on 1 day off Lower California; on 5 days in the Gulf of Tehuantepec; and on 1 day near the Costa Rica coast. Along the eastern two-thirds of the northern and central routes 1 to 4 days of fog were observed in most of the 5° squares north of 35° N.

SEA-SURFACE TEMPERATURE SUMMARY FOR THE WESTERN CARIBBEAN SEA

By GILES SLOCUM

The area embraced in this summary is the 5° square from 80° W. to 85° W. and 15° N. to 20° N. The table shows monthly mean sea-surface temperatures, computed to tenths of a degree for the period 1920 to 1933, inclusive.

Monthly and annual sea-surface temperatures in the western Caribbean Sea, 1920 to 1933, inclusive

Year	Total number of observations for the year	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1920	205	77.7	78.0	78.8	79.4	80.5	81.1	81.3	82.0	82.2	81.8	82.2	80.2	80.4
1921	328	78.5	79.4	78.4	79.8	80.7	80.9	81.8	81.7	81.9	81.8	80.7	80.4	80.5
1922	246	79.5	78.6	79.3	79.2	79.8	81.2	81.6	81.8	83.0	82.2	81.6	79.2	80.6
1923	366	78.4	78.0	78.5	79.5	81.1	80.9	81.7	82.4	82.7	81.4	80.8	79.5	80.4
1924	331	78.7	77.7	78.4	79.7	81.3	81.8	81.5	82.8	84.2	82.0	81.0	79.8	80.7
1925	512	78.9	78.9	78.6	80.6	81.4	81.4	81.4	82.3	82.5	82.7	82.1	80.9	81.0
1926	602	79.6	78.9	79.5	81.1	82.2	82.3	83.3	83.1	82.1	82.8	81.6	80.9	81.4
1927	624	79.0	79.3	79.6	80.2	81.3	82.4	82.3	83.1	84.2	83.6	81.7	80.5	81.4
1928	608	78.8	78.5	78.6	79.5	80.8	81.5	81.3	82.9	82.8	82.6	81.9	79.4	80.7
1929	714	79.4	78.8	79.7	80.0	80.2	81.5	82.0	82.3	82.5	82.4	81.9	80.0	80.9
1930	616	78.6	78.9	79.5	79.9	82.2	82.1	82.3	83.0	83.4	83.7	81.9	80.5	81.3
1931	679	80.5	79.2	79.8	80.6	83.2	83.9	83.6	83.7	83.9	83.2	81.8	80.7	82.0
1932	665	80.1	79.6	80.1	80.5	80.8	82.5	82.8	83.6	84.4	84.1	81.1	79.6	81.6
1933	690	79.3	79.5	79.9	80.4	81.4	82.8	83.0	83.6	83.4	82.5	81.3	79.4	81.4
Number of years' record		14	14	14	14	14	14	14	14	14	14	14	14	14
Mean (1912-33)		79.1	78.8	79.2	80.0	81.2	81.9	82.1	82.7	83.1	82.8	81.5	80.1	81.0

DUST STORMS

[Compiled by W. A. MATTICK]

Dust storms, or wide-spread dusty conditions, were first brought to the attention of many people during November 1933 when dust was transported from our Midwestern States to eastern sections. During the spring of 1934 other wide-spread distributions of dust occurred, culminating with one of marked intensity in May. These storms have been rather fully reported in the February 1935 MONTHLY WEATHER REVIEW.

The period June 1, 1934, to February 28, 1935, was one of continued dusty conditions over the Plains States. There were not, however, such favorable combinations of air movement as to carry the dust over great distances. The storms were confined largely to the section of origin—the western Plains. Figure 1 shows for this period the

number of days with dusty conditions, as reported by first-order stations of the Weather Bureau. There are two regions of intense dustiness, centered in eastern South Dakota and in northwestern Texas. The latter locality has continued to be unfavorably dry, but the former had beneficial precipitation during early April this year. During the period under consideration there were only two instances of dust being transported over large distances from the place of origin. The first was around June 1, 1934, and the second about February 22, 1935. In neither of these cases, however, was the dust widely distributed; it was confined to the upper Mississippi Valley, except for scattered, localized occurrences elsewhere.

During March 1935 dust storms increased in frequency, if not in intensity. Figure 2 shows the number of days with dusty conditions reported during March. The region of greatest dustiness was again the Texas Panhandle and southwestern Kansas where there has been no relief from the extremely dry conditions that have persisted so long.

The following extracts from reports of section centers show the intensity and seriousness of the dust:

Denver, Colo.—February 1935. Frequent destructive dust storms which occurred from the foothills region to the Kansas border became so severe at times that schools were closed and people generally remained indoors. It was sometimes necessary to use artificial light during the midafternoon. One death resulted on the 21st near Arriba when two section cars collided on a railroad, due to limited visibility during the storm.

March 1935: Loose topsoil from thousands of farms in the drought-stricken area of eastern Colorado was carried by winds of high velocity, reducing visibility and causing hazardous driving and flying conditions. The wind velocity at the Denver Municipal Airport reached 77 miles per hour during the afternoon of the 15th. The total loss at Canon City as a result of the storm was estimated at \$8,000. Telephone lines were blown down, houses seriously damaged, windows crushed, and highway travel made extremely dangerous through Fremont County, where the total damage was estimated at \$20,000. Cherry orchards in the rich agricultural section between Fort Collins and Loveland suffered severely when

westward to the one hundred and seventh meridian in northern and central sections and nearly to the western border south of the thirty-third parallel. During this period the sun was completely obscured much of the time. Visibility was zero in eastern counties and from one-fifth to three-fourths mile in central areas. Dust and sand storms were both frequent and severe on other dates. Much damage resulted, some of permanent nature, from blowing soil in the eastern plains section. Severe storms were noted on the 4th-5th, 15th to 20th, and 27th to 30th.

Houston, Tex.—Dust storms were unusually widespread and severe during March 1935, there being only three dates on which dust was not reported at some station in the State, namely the 2d, 12th, and 24th. During the first half of the month, dust was reported at many northwestern and western stations and at a few stations in the central portion of the State. The most severe storm during this period occurred on the 3d and 4th; many towns in the northwestern division reported that lights were necessary during the daytime, especially on automobiles, and at intervals the darkness was equal to that of the darkest night.

From an agricultural standpoint the Panhandle section seems to have suffered the only ill effects of the dust storms; vegetation was retarded in general, even where sufficient subsoil moisture existed, while soil erosion, due to accompanying strong winds, was great.

Des Moines, Iowa.—The most extensive reports were on March 20, with very widespread dust storms. Dust very dense for short periods of time. In extreme southwest corner of State, visibility of only 100 feet reported at Riverton, 300 feet at Thurman, and 200 yards at Shenandoah.

An encouraging feature of these storms is the fact that the major soil blowing seems to have been confined to a

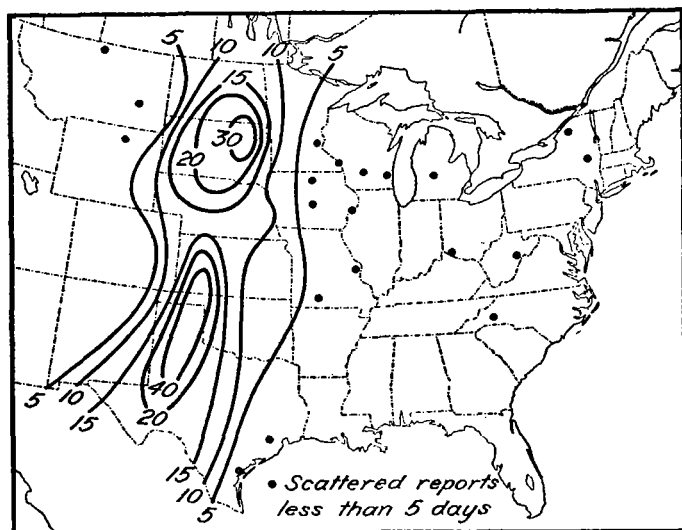


FIGURE 1.

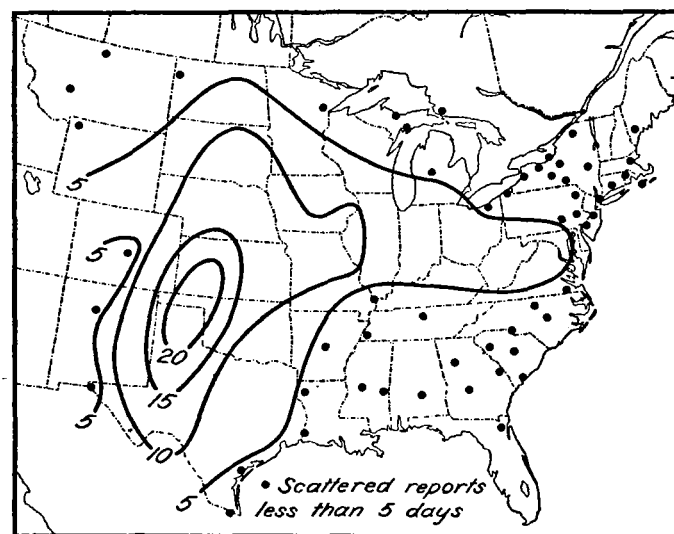


FIGURE 2.

the freshly plowed soil was swept away, leaving the roots of the trees bare. The topsoil was also blown from many fields that produce winter wheat and alfalfa. The damage was greatest in southeastern counties, e. g., Kiowa, Prowers, Baca, and eastern Bent and Las Animas Counties, where the suffocating dust storms which occurred frequently from the 12th to the 25th brought death to 6 persons and serious illness to more than 100 others. In many places the dust lay from a few inches to more than 6 feet deep and considerable livestock perished from starvation and suffocation.

Numerous reports state that since the storm on the 15th the air has been more or less dust-laden, making breathing and living conditions generally uncomfortable. Schools were closed in many localities as a measure of safety and many ranch homes were deserted by their tenants. Reliable reports state that no accurate estimate of the damage to topsoil through the drought area can be made, but that it will amount to millions of dollars.

Huron, S. Dak.—The storm of March 28 was the worst of the season. This dust storm, accompanied by a high wind, dried out the top surface of the soil rapidly. The encouraging feature of the storm was the many reports to the effect that most of the blowing soil was not local, but from other States. There was some damage to growing crops which by the last day of the storm were wilting and being pounded into the ground.

Albuquerque, N. Mex.—The most severe and wide-spread storm occurred on March 27-28. On the 27th dust hung over the eastern tier of counties, slowly thickening and spreading westward. Visibility was from one-fifth to 3 miles. On the 28th it had extended

relatively small portion of the agricultural area of the country. The section of greatest intensity is localized in the Panhandle of Texas and adjoining parts of other States, comprising only a small part of the total crop lands. The damage from these storms, although severe in certain localities, is not great, considering the whole agricultural sections of the United States. The principal cause of much crop loss in sections adjoining the area of greatest soil blowing was the extreme drought that has prevailed there for a long time. In fact, it has been reliably indicated that much of the wheat in this portion was already severely injured by dryness, if not actually killed.

So far this year, to mid-April, there has not been any great movement of soil outside the critical area mentioned above. The northern Plains have had beneficial precipitation in many parts and, while some increasing dryness is apparent, rains or snows have been adequate to prevent any large movement elsewhere in the Plains.

During the period June 1, 1934, to February 28, 1935, there were 513 reports of dust or dusty conditions, averaging about 57 reports a month, although not equally

distributed. The reports were rather numerous from western sections during June-October 1934, but then decreased in number until the latter part of February 1935. During March 1935, as last reported, there were 615 instances of duststorms or dusty conditions, many of them being light and not appreciably affecting the visibility, particularly in Eastern States. West of the Appalachian Mountains to the Rockies, however, there were many instances of visibilities less than 1 mile, a total of 138 such occurrences being noted. The total

number of first-order Weather Bureau stations reporting the presence of dusty conditions was 119, or a large majority of those canvassed. The great duststorm of last May, previously noted, brought only 182 reports from Weather Bureau stations. As this was considered the worst one at that time, it is evident that March 1935 probably breaks all previous records as a dusty month, but the records for previous years have not been examined.

CLIMATOLOGICAL TABLES

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Condensed climatological summary of temperature and precipitation by sections, March 1935

[For description of tables and charts, see REVIEW, January, p. 37]

Section	Temperature								Precipitation							
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly			
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount		
° F.	° F.	° F.			° F.		In.	In.	In.		In.					
Alabama.....	62.1	+6.3	Eufaula.....	90	23	Goodwater.....	19	1	7.30	+1.37	Seven Hills.....	16.12	Geneva.....	2.62		
Arizona.....	49.9	-4.2	Gila Bend.....	92	30	Bright Angel R. S.....	-7	6	1.50	+1.54	Bright Angel R. S.....	6.16	Wellton.....	.04		
Arkansas.....	58.7	+6.2	2 stations.....	90	25	Sunset.....	18	7	8.29	+3.50	Lutherville.....	16.35	Magnolia.....	1.85		
California.....	46.1	-5.3	do.....	96	14	2 stations.....	-18	9	3.88	+1.29	Inskip.....	12.73	2 stations.....	T		
Colorado.....	37.4	+2.9	Holly.....	87	15	Hermit (near).....	-35	6	1.00	-1.30	Cumbres.....	6.89	9 stations.....	T		
Florida.....	69.3	+3.8	4 stations.....	96	22	Cottage Hill.....	21	1	.99	-2.11	Caryville.....	3.85	3 stations.....	.00		
Georgia.....	61.4	+5.0	2 stations.....	95	22	Blairsville.....	10	1	4.59	-1.29	Flat Top.....	8.74	Fargo.....	.83		
Idaho.....	33.5	-2.3	Grand View.....	78	15	Pelton Ranch.....	-17	5	1.72	-1.02	Pierce.....	7.02	Aberdeen.....	.30		
Illinois.....	47.0	+7.0	New Burnside.....	85	23	Mount Carroll.....	4	8	4.64	+1.57	Cairo.....	12.00	Oregon.....	1.56		
Indiana.....	48.0	+7.4	Shoals.....	85	20	Notre Dame.....	14	9	5.05	+1.29	Madison.....	10.21	Greencastle.....	2.14		
Iowa.....	40.7	+6.3	Sioux City.....	85	15	6 stations.....	-2	17	1.47	-1.26	Keosauqua.....	6.82	Clarinda.....	.24		
Kansas.....	51.0	+7.8	2 stations.....	90	15	Hanover.....	0	7	.82	-1.62	Coffeyville.....	3.88	2 stations.....	T		
Kentucky.....	54.6	+8.4	Princeton.....	86	22	Quicksands.....	20	1	9.56	+4.85	Princeton.....	14.65	Grant.....	4.93		
Louisiana.....	66.1	+5.6	Dodson.....	94	22	Franklinton.....	21	1	6.43	+1.64	Angola.....	15.86	Grand Cane.....	1.14		
Maryland-Delaware.....	47.6	+4.6	Hancock, Md.....	86	16	Sines, Md.....	10	9	3.02	-1.42	Friendsville, Md.....	4.51	Picardy, Md.....	1.95		
Michigan.....	33.8	+4.2	St. Joseph.....	75	16	Sidnaw.....	-16	3	1.93	-1.24	St. Joseph.....	4.52	St. Ignace.....	.32		
Minnesota.....	29.3	+3.0	Pipestone.....	73	14	2 stations.....	-18	12	1.52	+1.33	Pigeon River Bridge.....	3.00	Angus.....	.48		
Mississippi.....	63.2	+6.4	3 stations.....	90	27	do.....	23	1	8.33	+2.51	Woodville.....	17.30	Pontotoc.....	2.39		
Missouri.....	50.4	+6.7	Jackson.....	87	23	Maryville.....	8	17	5.27	+2.09	Sikeston.....	14.61	Edgerton.....	.29		
Montana.....	28.8	-1.9	Whitehall.....	79	14	Medicine Lake.....	-34	7	1.28	+1.32	Haugan.....	7.19	Simpson (near).....	.11		
Nebraska.....	42.7	+6.5	2 stations.....	89	15	Ewing.....	-8	7	.78	-1.32	Fort Robinson.....	2.80	Upland.....	.05		
Nevada.....	38.6	-1.9	Logandale.....	89	30	Marlette Lake.....	-5	9	.85	-1.13	Marlette Lake.....	3.86	2 stations.....	.00		
New England.....	33.6	+1.3	Waterbury, Conn.....	76	16	Bloomfield, Vt.....	-22	1	1.82	-1.46	Lake Konomoc, Conn.....	3.29	Brattleboro, Vt.....	.82		
New Jersey.....	43.0	+3.9	2 stations.....	81	16	Runyon.....	-6	1	2.46	-1.32	Phillipsburg.....	3.51	Belleplain.....	1.51		
New Mexico.....	46.2	+1.4	Nara Visa.....	90	27	2 stations.....	-10	16	.39	+1.36	Chama.....	2.45	21 stations.....	.00		
New York.....	35.1	+3.0	Geneva.....	76	16	do.....	-24	11	2.05	-1.97	Booneville.....	3.34	Beaver River.....	.75		
North Carolina.....	55.5	+5.6	3 stations.....	91	21	Mount Mitchell.....	10	1	5.01	+1.78	Banners Elk.....	9.16	Southport.....	.74		
North Dakota.....	26.3	+2.2	Mott.....	75	14	Dunn Center.....	-37	7	1.02	+1.32	Richardton.....	2.49	Howard.....	.20		
Ohio.....	46.2	+7.5	2 stations.....	80	16	Hiram.....	14	9	3.35	-1.02	Hillsboro.....	7.16	Lake Milton.....	1.35		
Oklahoma.....	57.4	+6.8	Hugo.....	94	26	5 stations.....	17	7	3.86	+1.66	Spavinaw.....	11.61	Boise City.....	.30		
Oregon.....	37.3	-3.6	Brookings.....	78	28	2 stations.....	-7	9	2.98	+1.22	Jensen Ranch.....	14.27	Prineville.....	.05		
Pennsylvania.....	42.8	+5.1	2 stations.....	83	16	Gouldsboro.....	-6	9	2.62	-1.82	Greensburg.....	4.49	Gratersford.....	1.22		
South Carolina.....	59.7	+5.1	do.....	94	21	Chester.....	18	1	2.62	-1.28	Caesars Head.....	5.30	Charleston.....	1.02		
South Dakota.....	36.2	+5.3	5 stations.....	82	14	Lemmon.....	-16	6	1.27	+1.15	Leola.....	3.10	Bison.....	.25		
Tennessee.....	56.7	+7.4	Etowah.....	89	23	Norris.....	11	1	7.77	+2.36	Erwin.....	13.18	Gatlinburg.....	4.46		
Texas.....	64.0	+5.3	Mission.....	103	27	4 stations.....	20	11	1.82	-1.26	Bon Wier.....	8.25	7 stations.....	.00		
Utah.....	36.8	-1.6	St. George.....	81	29	Soldier Summit.....	-15	6	1.41	+1.02	Silver Lake.....	5.01	Wendover.....	.10		
Virginia.....	50.6	+4.9	Clarksville.....	87	22	Pennington Gap.....	11	1	4.95	+1.23	Emory.....	10.25	Mount Weather.....	1.41		
Washington.....	38.3	-2.7	Hanford.....	78	13	Winthrop.....	-4	5	4.29	+1.00	Wynoochee Oxbow.....	23.40	3 stations.....	.02		
West Virginia.....	48.7	+6.3	2 stations.....	86	16	Gary.....	10	1	5.51	+1.59	Williamson.....	11.87	Wardensville.....	1.65		
Wisconsin.....	32.1	+2.8	Beloit.....	71	15	Long Lake.....	-14	3	1.32	-1.45	Cornucopia.....	3.39	Plum Island.....	.34		
Wyoming.....	30.4	+1.9	Torrington.....	78	14	South Pass City.....	-27	10	.97	-1.20	Bechler River.....	5.15	Moorecroft.....	.14		
Alaska (February).....	15.5	+5.5	Sitka.....	57	3	Allakaket.....	-59	1	2.73	+1.68	Cordova.....	18.22	Barrow.....	.01		
Hawaii.....	60.4	+1.5	Waimanalo.....	89	9	Kanalohulubulu.....	42	22	7.40	-1.67	Kapoho.....	23.52	Mahukona.....	.70		
Puerto Rico.....	72.4	-1.0	Bayamon.....	91	28	Guineo Reservoir.....	45	18	1.67	-1.81	2 stations.....	7.56	7 stations.....	.00		

¹ Other dates also.